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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,215	12/19/2005	Masafumi Sakuma	Q91310	4045

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EXAMINER	
KIM, JOHN K	

ART UNIT	PAPER NUMBER
2834	

MAIL DATE	DELIVERY MODE
09/30/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/561,215	SAKUMA ET AL.	
	Examiner	Art Unit	
	JOHN K. KIM	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/19/2005, 4/10/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to papers filed on 27 August 2008. Amendments made to the claims and Applicant's remarks have been entered and considered.

2. Claims 1-8 are pending and are presented for examination. Claims 1-2 have been amended, claims 6-8 are newly added.

Response to Arguments

3. Claim rejection under 35 U.S.C. 112 has been withdrawn as it has been amended.

4. Applicant's arguments filed have been fully considered.

5. Applicant amended claim with new limitations and therefore arguments moot.

Response to Amendment

6. The examiner reviewed amended claims and remarks as follows.

7. The applicant amended claims with new limitation to highlight the fact such that the magnetic path having the width reducing portion provided therein avoids a location of highest magnetic flux concentration. However, cited prior art (Sakuma et al (US 2003/0094875)) teaches the same width reducing portion (see arrow at right side sketch below) as that (101) in the invention (see arrow at left side sketch below). In both figures, the recesses are located to align with center of tooth. It is also extremely well known for those skilled in the art in order to avoid local flux density get higher and loss

increment as a result. See Hiwaki et al (US 6836051), Armstrong et al (US 5045742) and Sakagami et al (US 6448682) for examples.

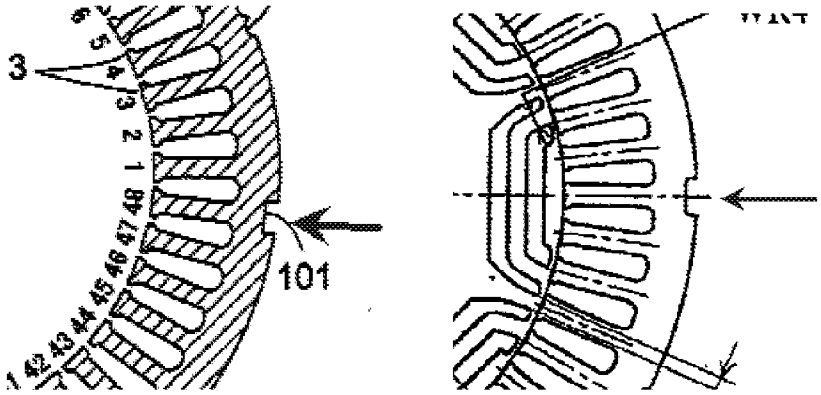
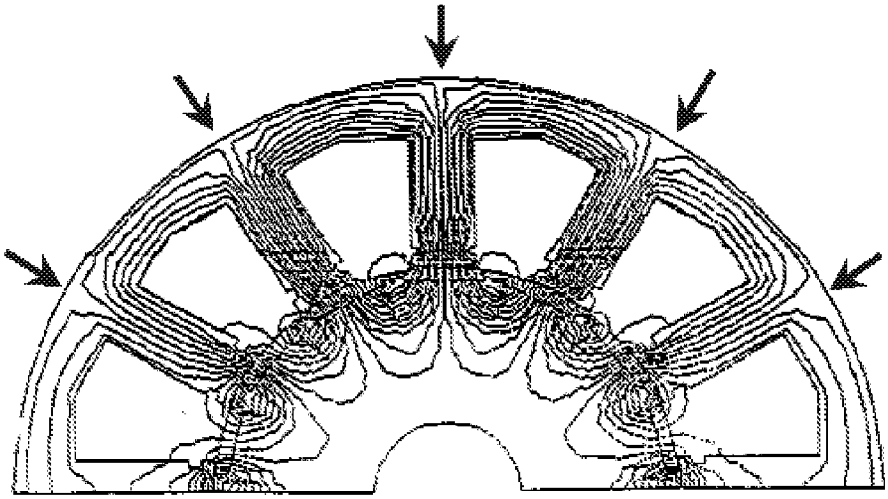


Figure below shows the reason for above teachings. Abukawa (US 6335582) Fig. 4 is copied here for exemplary flux view made by finite element analysis, and to show the reason why those locations are preferred.



Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

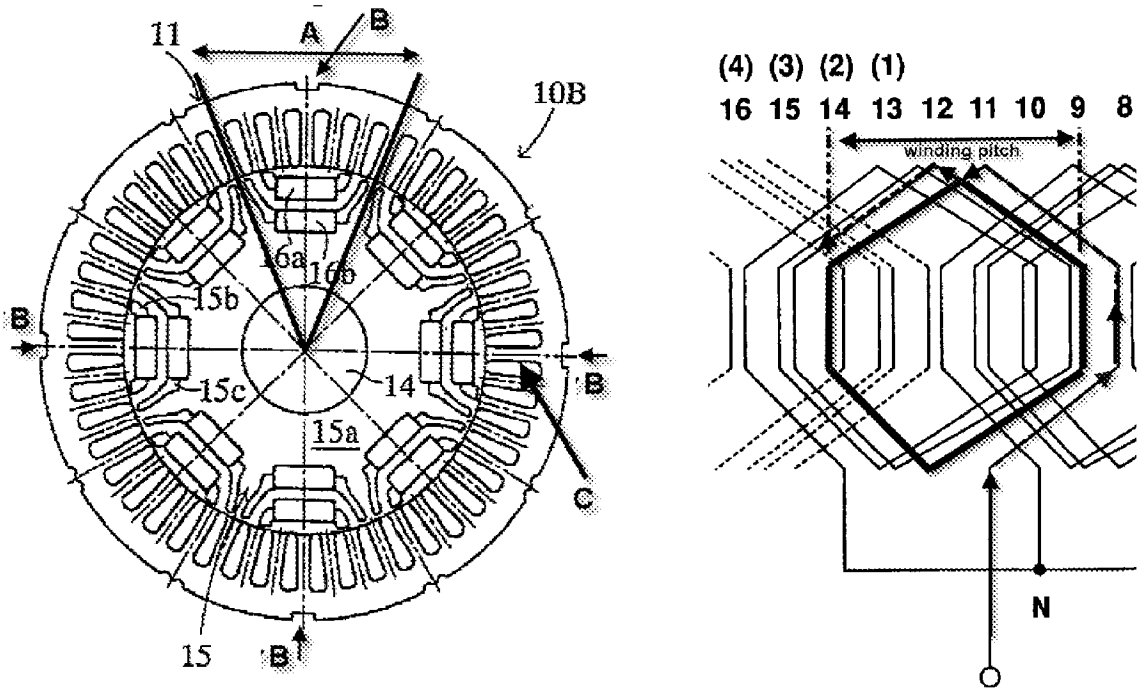
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1 and 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nashiki (US 6211593) and in further view of Kazmierczak (US 2003/0001450).

As for claim 1, Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth such that the

magnetic path having the width reducing portion provided therein avoids a location of highest magnetic flux concentration. Sakuma, however, failed to teach or suggest stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a three-phase drive mode. In the same field of endeavor, Nashiki teaches (in Fig. 14, and right side sketch below) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors), , in a three-phase drive mode (Fig. 11). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nashiki with that of Sakuma for reduction of torque ripple. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Nashiki that of Sakuma for high efficiency drive. The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Kazmierczak teaches (in Figs. 1-2) in a back yoke portion of the stator (10) corresponding to a tooth (between slots 14-15 or 16-17) adjacent a tooth (between slots 15-16) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was

made to combine the teaching of Kazmierczak with those of Sakuma and Nashiki for harmonic reduction.



As for claim 3, Sakuma, Nashiki and Kazmierczak teach the claimed invention as applied to claim 1 above. Sakuma further teaches (in Fig. 2) wherein a center position of said width reducing portion (see B in sketch in claim 1 above) and a center position of said tooth are aligned with each other along the peripheral direction of the stator (11), and said width reducing portion (see B in sketch in claim 1 above) is formed along the peripheral direction of the stator by an area smaller than two pitches of the teeth (see C in sketch in claim 1 above).

As for claim 4, Sakuma, Nashiki and Kazmierczak teach the claimed invention as applied to claim 1 above. Sakuma further teaches (in Fig. 2) a plurality of said width reduced portions (B in sketch in claim 1 above) are provided along the peripheral

direction of the stator by a pitch of n/3 (n: a natural number) of the pitch of the rotor magnetic poles. (in this case, n=6 and therefore, the width reduced portions pitch is 90 degree while pitch of the rotor magnetic poles is 45 degree)

As for claim 5, except claim dependency, claim 5 contains the same limitation as claim 4 and is rejected for the same reason set forth in connection with the rejection of claim 4 above.

11. Claims 2 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nashiki (US 6211593) and in further view of Kazmierczak (US 2003/0001450) and Iijima et al (US 6081087).

Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth such that the magnetic path having the width reducing portion provided therein avoids a location of highest magnetic flux concentration. Sakuma, however, failed to teach or suggest said stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, and wherein in a back yoke portion of the stator corresponding to a tooth located

between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a two-phase rectangular wave drive mode. In the same field of endeavor, Nashiki teaches (in Fig. 14) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nashiki with that of Sakuma for reduction of torque ripple. The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Kazmierczak teaches (in Figs. 1-2) in a back yoke portion of the stator (10) corresponding to a tooth (between slots 15-16) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Kazmierczak with those of Sakuma and Nashiki for harmonic reduction. The references, however, failed to teach in a two-phase-on rectangular wave drive mode. In the same field of endeavor, Iijima teaches in (Fig. 7) a two-phase-on rectangular wave drive mode (see waveforms h, I, j). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Iijima those of Sakuma, Nashiki and Kazmierczak for low cost drive.

As for claim 6, except claim dependency, the claim contains the same limitation as claim 3 and is rejected for the same reason set forth in connection with the rejection of claim 3 above.

As for claims 7 and 8, except claim dependency, the claim contains the same limitation as claim 4 and is rejected for the same reason set forth in connection with the rejection of claim 4 above.

12. Claim 1 is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nashiki (US 6211593) and in further view of Buening et al (US 2002/0093266).

As for claim 1, Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth such that the magnetic path having the width reducing portion provided therein avoids a location of highest magnetic flux concentration. Sakuma, however, failed to teach or suggest stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth

located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a three-phase drive mode. In the same field of endeavor, Nashiki teaches (in Fig. 14, and right side sketch below) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors), , in a three-phase drive mode (Fig. 11). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nashiki with that of Sakuma for reduction of torque ripple. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Nashiki that of Sakuma for high efficiency drive. The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Buening teaches (in Figs. 1, 3A and sketch below) in a back yoke portion of the stator (10) corresponding to a tooth (3 or 5) adjacent a tooth (4) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Buening with those of Sakuma and Nashiki for harmonic reduction.

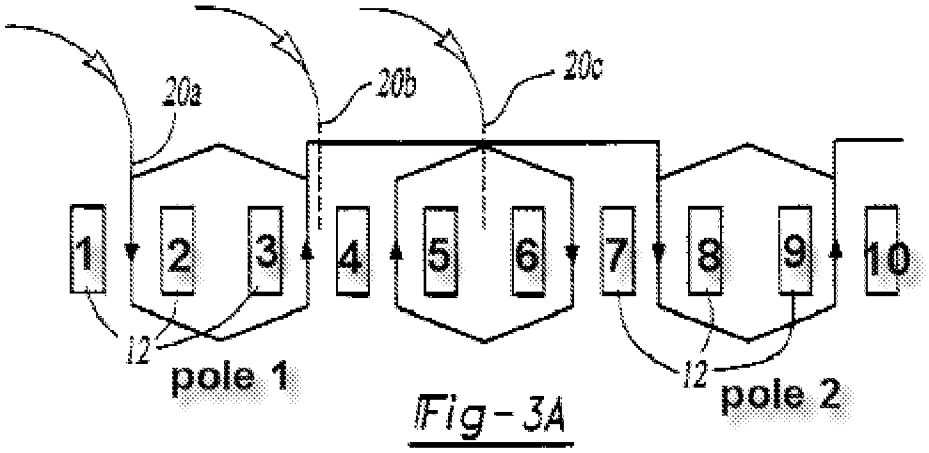


Fig-3A

13. Claim 2 is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Sakuma et al (US 2003/0094875) in view of Nashiki (US 6211593) and in further view of Buening et al (US 2002/0093266) and Iijima et al (US 6081087).

Sakuma teaches (in Fig. 2) a three-phase synchronous reluctance motor (10b) comprising a rotor (15) and a stator (11) having a plurality of teeth formed in an inner face thereof along a peripheral direction and in opposition to said rotor (15), six of said teeth (see A in sketch below) being in opposition to one of a plurality of rotor magnetic poles provided in the rotor (15), there is provided at least one width reducing portion (see B in sketch below) which renders a width of a magnetic path of the back yoke portion (at numeric 11 pointed) of the stator (11) reduced relative to a width of a magnetic path of the back yoke portion corresponding to the other teeth such that the magnetic path having the width reducing portion provided therein avoids a location of highest magnetic flux concentration. Sakuma, however, failed to teach or suggest said stator having stator windings by a coil pitch corresponding to five teeth of said six teeth, and wherein in a back yoke portion of the stator corresponding to a tooth located

between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities in a two-phase rectangular wave drive mode. In the same field of endeavor, Nashiki teaches (in Fig. 14) stator having stator windings by a coil pitch corresponding to five teeth of said six teeth (col. 12, line 63-64; pole pitch is 6 and winding pitch is 5 for both motors). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Nashiki with that of Sakuma for reduction of torque ripple. The references, however, failed to teach wherein in a back yoke portion of the stator corresponding to a tooth adjacent a tooth located between an adjacent pair of said stator windings which form magnetic poles in a same phase and with different polarities. In the same field of endeavor, Buening teaches (in Figs. 1, 3A and sketch above) in a back yoke portion of the stator (10) corresponding to a tooth (4) located between an adjacent pair of said stator windings which form magnetic poles (poles 1 and 2) in a same phase and with different polarities. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of Buening with those of Sakuma and Nashiki for harmonic reduction. The references, however, failed to teach in a two-phase-on rectangular wave drive mode. In the same field of endeavor, Iijima teaches in (Fig. 7) a two-phase-on rectangular wave drive mode (see waveforms h, I, j). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teaching of with Iijima those of Sakuma and Nashiki for low cost drive.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN K. KIM whose telephone number is (571)270-5072. The fax phone number for the examiner where this application or proceeding is assigned is 571-270-6072. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JK

/Darren Schuberg/

Supervisory Patent Examiner, Art Unit 2834